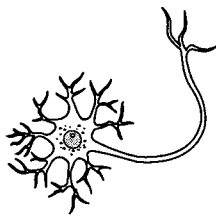




# **High School Test in Science**

***Released Items  
Spring 2000***

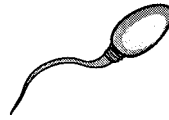
1



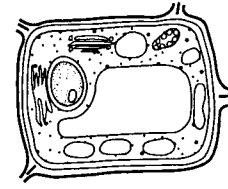
Cell 1



Cell 2



Cell 3



Cell 4

Which of these cells uses sunlight to produce food?

**A** Cell 1

**B** Cell 2

**C** Cell 3

**D** Cell 4

- 3** A researcher was trying to determine the effects of the drug AZT on the HIV virus, using 200 infected rats. One hundred of the rats were each given a daily injection of 10 ml of a solution of AZT and water for a period of 3 months. What should the researcher give the remaining 100 rats each day?

**A** an injection of 10 ml of AZT  
**B** an injection of 10 ml of water  
**C** an oral dose of 10 ml of water  
**D** food containing 10 ml of AZT

- 5** A student filled four identical containers with pond water. A different concentration of nitrogen fertilizer was added to each container. Each container was placed on the same window sill. One day each week for four weeks, the organisms in each container were identified and counted to see how the different concentrations of fertilizer had affected the growth of the organisms. What was the variable being tested in this experiment?

**A** the amount of light  
**B** the type of container  
**C** the concentration of fertilizer  
**D** the types of organisms in the water

Read the following investigation carefully. Then answer questions 15 and 16.

### INVESTIGATION

Problem Does skipping breakfast help a person to lose weight?

Hypothesis Skipping breakfast will cause a person to lose weight.

Procedure

1. Three students will weigh themselves to obtain their starting weight.
2. The three students will not eat breakfast for a period of three weeks.
3. At the end of three weeks, the students will re-weigh themselves.

<u>Results</u>	Starting Weight	Weight After 3 Weeks
Student A	100	99
Student B	90	92
Student C	120	114

Conclusion Skipping breakfast causes weight loss.

**15 (2 points)**

Two out of the three students lost weight during this experiment. Identify two reasons other than skipping breakfast that could account for weight loss in these two students.

**15a) Key Elements:**

- They may have eaten less food at other meals and snacks.
- They may have been more physically active than usual.
- They may have experienced mental illness.
- They may have experienced physical illness.
- They may have gained or lost body fluids/water (e.g. menstruation).
- Small sample size and random variation may have influenced the outcome.
- Their metabolism may have changed (e.g. higher metabolism or thyroid condition).
- They may have taken medication.
- Different scales may have been used for the different weight calculations.
- They may have drank more water during the 3 week period.
- The weight of their clothes may not have been taken into consideration.
- The students may have been weighed at different times of day or under different situations.
- Any reason which displays a lack of control of the variables in the investigation.

\*Students who give reasons such as “healthier diet” or “change in diet” must identify how the diet has changed. (e.g. a *reduced* amount of fat, *less* caloric intake, etc.)

Score Points:

2 points = 2 key elements

1 point = 1 key element

0 points = incorrect response

## 15b) Student Response 1

Water weight could have been lost (not a part of skipping breakfast). It's natural depending on the intake of fat, the weather, time of the month, etc.

If the students could have eaten less junk food, (been on a diet), increased exercise - there wasn't a control so we don't know if they did these things.

Score Point: 2

This response includes three key elements (water weight could have been lost, eaten less junk food, increased exercise).

## 15c) Student Response 2

These two students might have been very active, exercise wise those three weeks. They could have also changed their diets. They might have decided to eat healthier or their breakfast was a really fatty meal so when they stopped eating it, they lost weight.

Score Point: 1

This response includes one key element (...might have been very active).

## 15d) Student Response 3

One of the reasons the students could have lost weight, other than skipping breakfast is that they may have similar metabolism rates than the other students. They also could have been less hungry than the other student, which would result in weight loss.

Score Point: 0

This response does not include any valid key elements. The first reason (may have *similar* metabolism rates) does not show a lack of control in the investigation. The second reason (less hungry) is too vague.

**16 (2 points)**

A scientist might complain that this investigation “lacks a control.”

- How could you change the experiment to give it a control?
- Why is it necessary to have a control?

**16a) Key Elements:**

To add a control

A. There should be two groups of students – one group skips breakfast, the other does not.

**OR**

B. The same group of students could be used in a second 3 week period of observation during which they do eat breakfast.

**OR**

C. Make sure all students eat similar diets or get similar amounts of exercise (direct control of variables).

Why a control is necessary

A control is necessary to ensure that factors other than skipping breakfast are NOT responsible for the observed weight loss.

**OR**

To have something with which to compare the experimental group.

**OR**

A control strengthens the experiment by making the results more accurate.

Score Points:

2 points = 2 key elements

1 point = 1 key element

0 points = incorrect response

## 16b) Student Response 1

I would have chosen students with similar heights, weights, gender, and activity levels. Also, a controlled diet should have been used so no student ate more than the other. This way, the variables of the experiment would have been the same and the data would have been more conclusive.

Score Point: 2

This response receives credit for controlling heights, weights, gender, and activity levels, as well as including a controlled diet. It also recognizes that a control is needed to have data that's more conclusive.

## 16c) Student Response 2

One way to have a control would be to use students that are about the same weight and same life style. Then have one of them continue with their life style and the others act differently. It is necessary to have a control because a control is what change is based on.

Score Point: 1

This response receives partial credit for suggesting a control (have one of them continue with their lifestyle and the others act differently). The explanation for the control lacks understanding of why it is necessary.



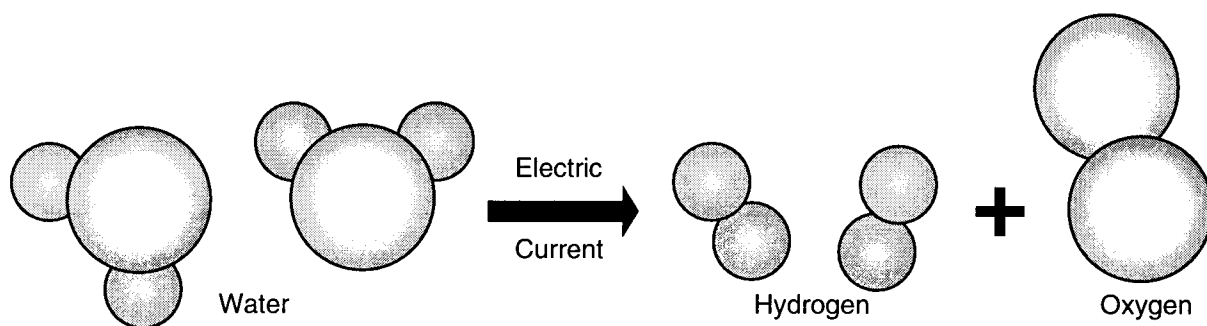
## 16d) Student Response 3

The Scientist needs one thing that is constant through the whole experiment, called the control. He could take care of his variables and set it at a constant temperature and condition.

Score Point: 0

This response is too vague in its suggestions and receives no credit.

- 17 The diagram shows a chemical reaction in which



- A energy is released.                      B energy is required.  
C energy is neither released nor absorbed.                      D energy is first released, then absorbed.

- 18

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra																
		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	

A chemist is looking for an element that will behave chemically like calcium (Ca)—atomic number 20. Which of the following would be the best choice?

- A Ba                      B K                      C Ga                      D C

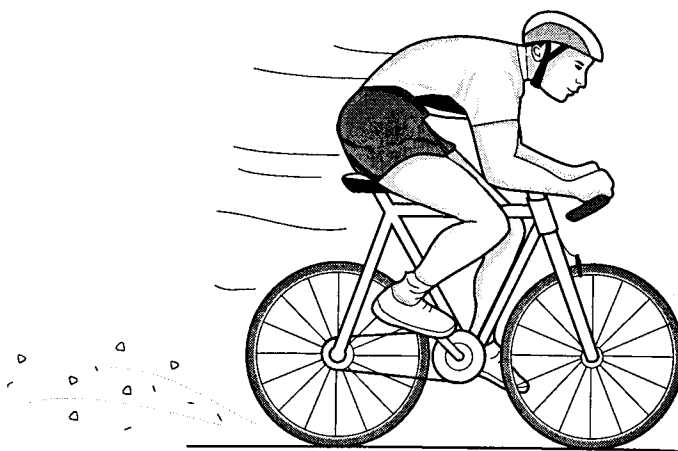
- 19** Four identical vehicles were traveling at 60 km/hr on the same road. **EACH DRIVER APPLIED A DIFFERENT AMOUNT OF PRESSURE TO THE BRAKES.** Their speeds were then measured every 0.5 seconds for the next 5 seconds and recorded in the following table. Study the table carefully.

	SPEED OF CAR IN KILOMETERS/HOUR			
Time (sec)	Car 1	Car 2	Car 3	Car 4
0.5	58	55	56	57
1.0	56	50	52	54
1.5	54	45	48	51
2.0	52	40	44	48
2.5	50	35	40	45
3.0	48	30	36	42
3.5	46	25	32	39
4.0	44	20	28	36
4.5	42	15	24	33
5.0	40	10	20	30

Compared to the total time it will take Car 3 to come to a complete stop, Car 1 will take

- A** half as long.
- B** twice as long.
- C** four times as long.
- D** the same amount of time.

- 21



Look at the following list of events that result in the forward motion of a bicycle.

1. The chain turns the wheel gear and the rear tire.
2. The feet push on the pedals.
3. The rear tire pushes against the road surface.
4. The pedal gear turns the chain.

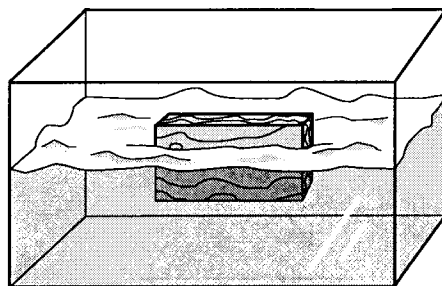
Which of these shows the correct order for these events?

- A** 2-1-3-4      **B** 2-4-1-3      **C** 2-4-3-1      **D** 2-3-1-4

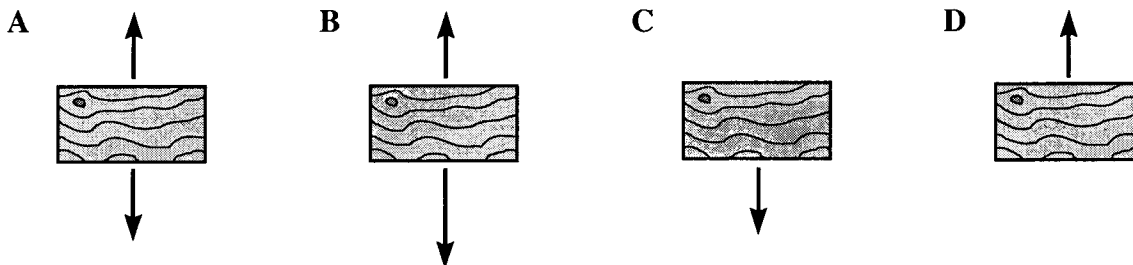
- 23 Some people are concerned about possible health risks associated with electromagnetic fields (EMFs) that surround working electrical appliances. Which of the following observations provides the best evidence for stricter control of EMFs?

- A EMFs flow freely through Earth's atmosphere.
- B A prominent politician has argued for stricter control of EMFs.
- C Chick embryos exposed to EMFs have more developmental abnormalities than chick embryos **NOT** exposed to EMFs.
- D The strength of the EMF decreases with the square of the distance from the electrical appliance that is generating the EMF.

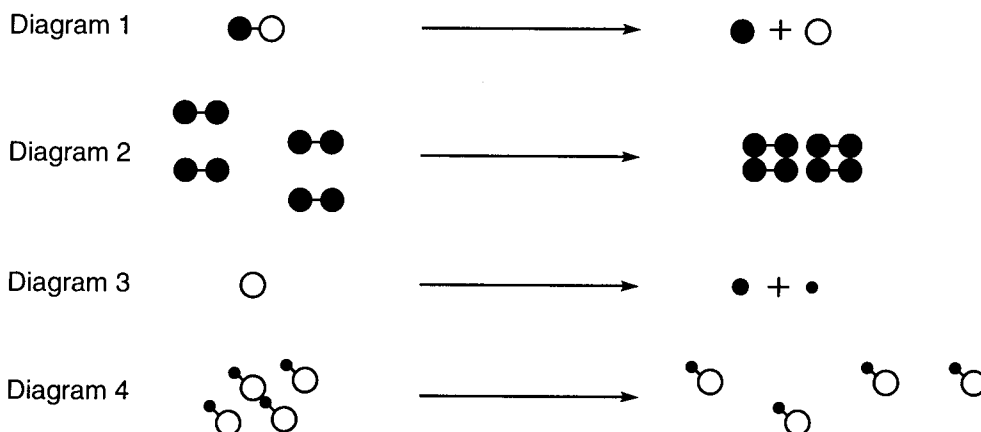
27



The diagram shows a block of wood floating in water. Which of the following diagrams best shows the forces acting on the block of wood?



The diagrams below show atoms and molecules undergoing different types of changes. Study the diagrams. Then answer questions 28 through 31.



Note: , , , and  represent different types of atoms.

- 28 What is shown in Diagram 1?
- A two atoms that join to form a molecule
  - B a molecule that breaks down into two different atoms
  - C an atom that splits to form two different atoms
  - D a pair of molecules that spread farther apart

- 29 Which diagram represents a nuclear change?
- A Diagram 1
  - B Diagram 2
  - C Diagram 3
  - D Diagram 4

- 30 The energy changes associated with Diagram 3 are explained by the theories of
- A Kepler.
  - B Newton.
  - C Galileo.
  - D Einstein.

**31 (3 points)**

Compare and contrast physical and chemical changes. In your response, describe two similarities and two differences.

**31a) Key Elements:**Similarities

Both kinds of change involve a transfer of energy.

A

**OR**

In both kinds of change, energy is either added or released.

**OR**

Both use/require energy.

B

Both kinds of change may alter the appearance of a substance.

(both are visible changes, both look different, both may be a change in the state of matter)

C

In both kinds of change, matter is neither created nor destroyed.

NOTE: It is insufficient for student to state very general similarities such as "both involve matter" or "both are changes."

Differences

No new substance is formed in physical change.

A

**OR**

New substance is formed/chemical reaction occurs in chemical change.

Energy transfer is usually greater in chemical change.

B

**OR**

Less energy is usually transferred in physical change.

Energy is usually applied for physical change to occur.

C

**OR**

Energy is usually released when chemical change occurs.

D

Reactants can't be separated by physical means following a chemical change.

Note: Physical change is reversible/chemical change is permanent receives no credit unless an example is given to prove this statement true.

Physical change does not involve a change in properties (chemical composition).

E

**OR**

Chemical change involves a change in properties (chemical composition).

F

Physical change involves a change in state (phase) or appearance only.

G

Chemical change is at the atomic/molecular level.

NOTE: Inter vs. Intra Molecular Bonding (Physical/Chemical) is an acceptable difference.

Inner change vs. outer change (inside change/outside change) is too vague to receive credit as a difference.

Examples of physical or chemical changes (by themselves) do not receive credit.

**Score Points:**

3 points = 3 or 4 key elements (must be at least one similarity and one difference)

2 points = 2 key elements (can be only differences or only similarities)

1 point = 1 key element

0 points = incorrect response

## 31b) Student Response 1

In both physical and chemical changes, energy is released and the substance changes its appearance. However, in a physical change, the substance only changes state, while in a chemical change the substance changes into something new. Physical changes <sup>have the</sup> same molecular structure, , while chemical changes require a rearrangement of molecules.

Score Point: 3

This response includes two similarities (both release energy and change appearance) and three differences (in a physical change the substance only changes state, in a chemical change it becomes something new, and chemical change occurs at a molecular level rearranges the molecules).

## 31c) Student Response 2

Chemical changes are different from physical changes because they change the chemical make-up of the reactant. Physical changes deal with changing things like color, shape, mass, and volume. They are similar in that they both do some sort of change to the substance. Also both processes can be reversed.

Score Point: 2

This response includes two differences (chemical changes change the make-up/chemical composition of the reactant/original substance and physical changes change the appearance) and no valid similarities.

## 31d) Student Response 3

① physical change is different from chemical because physical you aren't changing the actual chemical structure of ~~anything~~ <sup>it</sup> chemical change you are, so

they are the same because they are both associated with science and they are both changing things.

Score Point: 1

This response includes one difference (in a physical change you aren't changing the chemical structure/composition and in a chemical change you are) and no valid similarities.

## 31e) Student Response 4

Physical change occurs when an action happens that makes a physical change happen. But a chemical change occurs when two things put or fused together as one.

Score Point: 0

This response includes neither similarities nor differences. It is too vague to merit credit.



Read the following article carefully. Then answer questions 32 and 33.

### GLOBAL WARMING

Carbon dioxide levels have increased in recent years, according to figures provided in a report given Wednesday night at a meeting of the Astronomical Society. Some scientists believe increased carbon dioxide levels are responsible for warmer temperatures worldwide over the past 10 years. Yet this global warming trend is far from dramatic, and the effect of increased carbon dioxide levels in Earth's atmosphere remains disputed.

Astronomers speaking at a local chapter meeting of the Astronomical Society cited studies of neighboring planets as evidence in support of the so-called greenhouse effect. The researchers cited Venus as a planet exhibiting extreme planetary warming. Venus has an atmosphere made up of more than 96 percent carbon dioxide. Its surface temperature is about 850°F, far hotter than expected based on its distance from the sun. The researchers voiced warnings that substantial releases of carbon dioxide into Earth's atmosphere could produce a warming trend of similar magnitude.

**32 (2 points)**

Some astronomers question using Venus as a model to predict how increased carbon dioxide levels in Earth's atmosphere will affect our planet. Describe three differences between Earth and Venus that might cause astronomers to question whether global warming data from Venus can be applied to Earth.

**32a) Key Elements:**

- Venus has no liquid water (i.e., bodies of water or surface water).
- Venus has no (evidence of) life.
- Earth has been altered by life forms (man).
- Venus has had a different geologic history than Earth (has a different concentration of elements).
- The planets have a different chemical make-up.
- Venus is closer to the sun than Earth is (Venus and Earth are different distances from the sun).\*
- Venus' period of rotation is different from Earth's.
- The atmosphere of Venus is different from Earth (Earth has more oxygen).

\*Venus is farther from the sun than Earth – receives no credit.

Score Points:

2 points = 3 key elements

1 point = 1 or 2 key elements

0 points = incorrect response

## 32b) Student Response 1

The differences between earth and venus would be that ① Venus is alot closer to the sun; ② Venus has none of the things we have here on earth to show proof such as trees, humans, etc. ③ Venus has a different atmosphere than we do, which is a totally different experiment and will not prove that the green house effect will make us like Venus,

Score Point: 2

This response includes three key elements (Venus is closer to the sun, has no life forms, and has a different atmosphere).

## 32c) Student Response 2

Earth & Venus have many differences that might cause scientists to question the application of Data from Venus to data from Earth. ① Earth and Venus are completely different distances from the sun and therefore have different temperatures. ② Earth and Venus are different sizes. ③ Earth and Venus have different chemical makeups.

Score Point: 1

This response includes two key elements (different distances from the sun and different chemical make-up).

## 32d) Student Response 3

I think that Venus is a planet that we really don't know much about & Earth we'll we do know about Earth.

Score Point: 0

This response gives one incorrect difference between Earth and Venus (we don't know much about Venus).

**33 (2 points)**

Some scientists have concluded that increased carbon dioxide levels in the atmosphere are responsible for the recent global warming trend. Give two reasons why other scientists may be reluctant to agree with this conclusion.

**33a) Key Elements:**

- A ten year study does not provide enough evidence to know for sure if Earth is experiencing global warming (too short a time to know if this is true).
  - Warming may be part of a larger pattern or cycle.
  - It's the ozone layer that is responsible for global warming.
  - Factors other than increased carbon dioxide levels in the atmosphere (e.g. weather patterns) could be contributing to global warming.\*
  - Global weather patterns are too complicated to conclude that the warming trend is only due to carbon dioxide levels.
  - Comparisons to other planets are not necessarily valid.
  - Some scientists might not agree with the scientific techniques used.
  - Some scientists believe the average temperature shows a cooling trend, not warming.
- The student may receive full credit for specifying two other factors AND explaining them.

**Score Points:**

2 points = 2 key elements

1 point = 1 key element

0 points = incorrect response

## 33b) Student Response 1

One reasons scientists might disagree with the idea that the increased  $\text{CO}_2$  in the atmosphere is the cause of global warming is that there are other chemicals being released which are destroying the ozone layer other than  $\text{CO}_2$ . Another reason might be the idea that instead of the increase in  $\text{CO}_2$ , scientists may be more worried about the decrease in oxygen amounts, which could also be a cause of global warming.

Score Point: 2

This response includes two key elements (other chemicals destroying the ozone layer and a decrease in oxygen amounts).

## 33c) Student Response 2

Some scientists may be reluctant to agree because they might think that what happens outside the earth's atmosphere wouldn't affect earth. There is also nothing proven that it has affected any other planet so why would it affect earth's atmosphere.

Score Point: 1

This response includes one key element (nothing proven it has affected other planets).

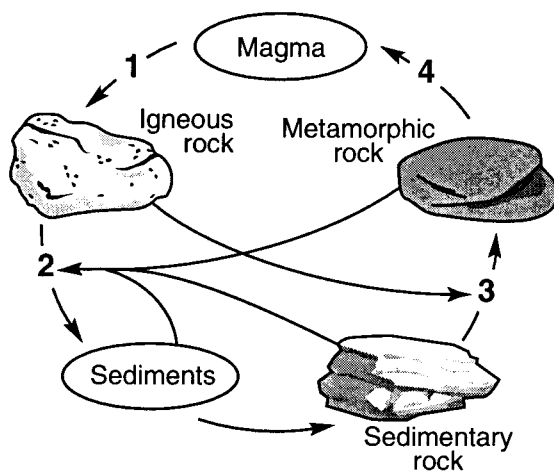
## 33d) Student Response 3

Venus' atmosphere is made of of 96 percent  $\text{CO}_2$  and is much hotter than Earth. Also the increase in  $\text{CO}_2$  is directly proportional to the increase in Earth's temperature.

Score Point: 0

This response focuses on the misconception that carbon dioxide is the cause of global warming.

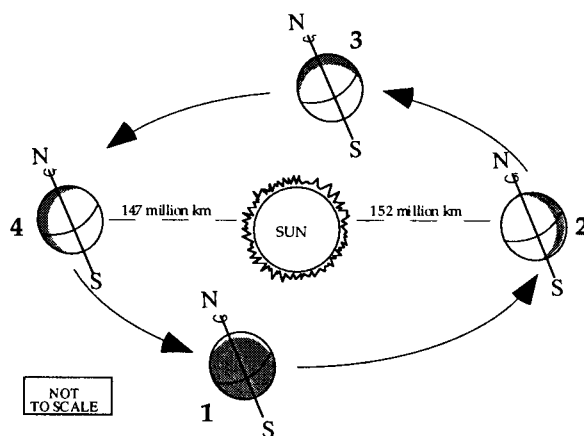
34



Number 4 in the rock-cycle diagram shown above indicates a process of

- A weathering, erosion, transportation, and deposition.
- B crystal formation due to heat and pressure.
- C melting under extremely high temperatures.
- D cooling and solidifying.

35



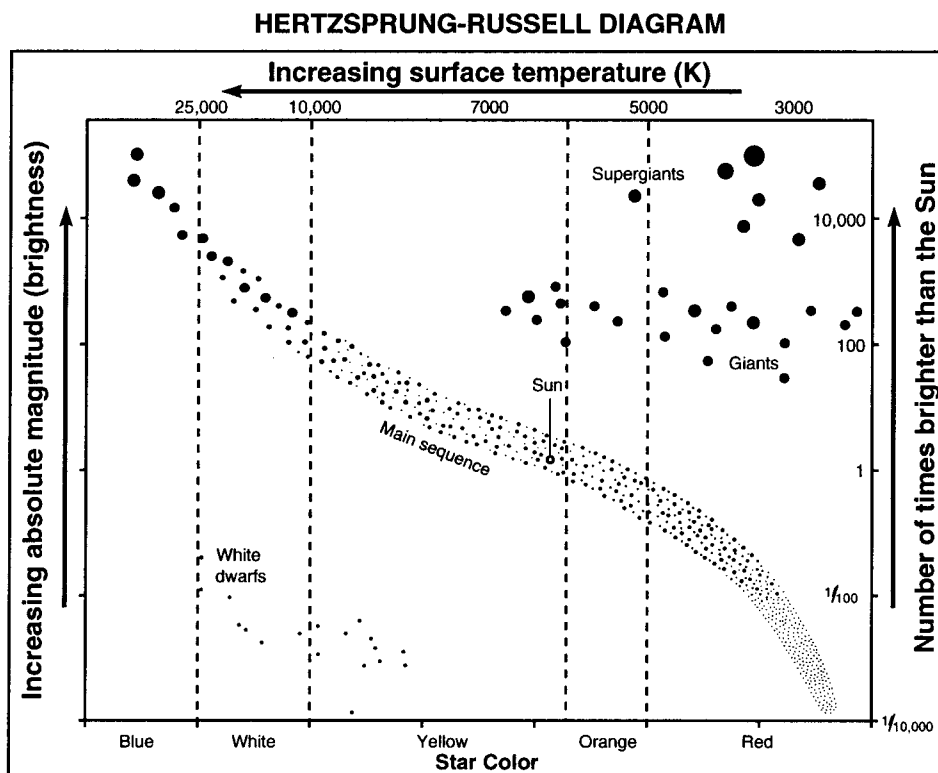
Which position of Earth represents winter time in the Northern Hemisphere?

- A position 1
- B position 2
- C position 3
- D position 4



- 36 What formed the basins occupied by the Great Lakes?
- A glaciers
  - B earthquakes
  - C meteors striking the Earth
  - D ocean bays being surrounded by land
- 39 Some scientists believe that the moon and Earth share a common origin. Which statement **BEST** supports this view?
- A The moon and Earth display nearly identical proportions of three forms of the element oxygen in their rocks.
  - B The moon and Earth both possess gravitational fields.
  - C The moon and Earth both spin on their axis in the same direction.
  - D The moon and Earth both revolve around the sun.
- 40 The presence of an ozone layer high in Earth's atmosphere is thought to be beneficial to living things because it
- A helps to prevent acid rain.
  - B blocks harmful rays coming from the sun.
  - C destroys pollutants in the atmosphere.
  - D prevents oxygen from escaping Earth's gravity.

42



Stars on the left half of the diagram shown above are

- A** hotter.                      **B** older.                      **C** larger.                      **D** more luminous.

District: PUBLIC SCHOOL  
Run Date: 09/06/2000

### Multiple Choice

### Constructed Response

Omit/Mult = Omits and Multiple Responses  
 X Number of students present rounds to zero